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     (FILE 'USPAT' ENTERED AT 10:00:39 ON 03 FEB 97)
L1            445 S THERMAL MANAGEMENT
                  SET PLURAL ON
L2         182076 S COMPUTER
L3            103 S L1 AND L2
L4          36751 S REAL TIME
L5             13 S L3 AND L4
                  E WATTS, L/IN
L6              2 S E4
L7              4 S E5
L8           1557 S CLOCK SPEED
L9              7 S L1 AND L8
L10             5 S (CPU OR CENTRAL PROCESSING UNIT)(W) TEMPERATURE
=> d 2

2.  5,422,806, Jun. 6, 1995, Temperature control for a variable frequency
CPU; Peng-Cheng Chen, et al., 364/149, 150, 153, 166 [IMAGE AVAILABLE]
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     (FILE 'USPAT' ENTERED AT 10:00:39 ON 03 FEB 97)
L1           445 S THERMAL MANAGEMENT
                 SET PLURAL ON
L2        182076 S COMPUTER
L3           103 S L1 AND L2
L4         36751 S REAL TIME
L5            13 S L3 AND L4
=> d 2,7

2.  5,590,061, Dec. 31, 1996, Method and apparatus for **thermal**
**management** in a **computer** system; J. Rhoads Hollowell, II, et al.,
364/571.03; 395/182.22, 750 [IMAGE AVAILABLE]

7.  5,535,401, Jul. 9, 1996, Method and system of power and **thermal**
**management** for a data processing system using object-oriented program
design; Freeman L. Rawson, III, et al., 395/750; 364/707 [IMAGE
AVAILABLE]
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=> d his
     (FILE 'USPAT' ENTERED AT 10:00:39 ON 03 FEB 97)
L1           445 S THERMAL MANAGEMENT
                 SET PLURAL ON
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L3           103 S L1 AND L2
L4         36751 S REAL TIME
L5            13 S L3 AND L4
                 E WATTS, L/IN
L6             2 S E4
L7             4 S E5
=> d 2

2.  5,218,704, Jun. 8, 1993, Real-time power conservation for portable
computers; **LaVaughn F. Watts, Jr.**, et al., 395/750; 364/273.1, 273.4,
707, 948.4, 948.5, 948.8, DIG.1, DIG.2 [IMAGE AVAILABLE]
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ID	MCH	TPE	NAME OR ACCOUNT	C-NBR	MLEDTE	CURDTE	F-C	$ AMOUNT
D	110	1	200668	11103	951207	960122	581	40.00
D	110	1	200668	11104	951207	960122	101	2,006.00

NO MORE TRANSACTIONS

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E003 WORD FREQUENCY SEARCH REPORT

Classification Analysis:

1. 395/750 Total=33 ORs=27 XRs=6
   Class 395 INFORMATION PROCESSING SYSTEM ORGANIZATION
   Sub 750 POWER CONTROL

2. 364/707 Total=23 ORs=1 XRs=22
   Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
   Sub 700 ELECTRIC DIGITAL CALCULATING COMPUTER
   Sub 707 .With power saving feature

3. 364/DIG. 1 Total=20 ORs=0 XRs=20
   Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
   Sub DIG. 1 GENERAL PURPOSE PROGRAMMABLE DIGITAL COMPUTER SYSTEMS

4. 364/273.1 Total=14 ORs=0 XRs=14
   Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
   Sub ???.13 POWER SYSTEM CONTROL
   Sub 273.1 .Reduction

5. 364/DIG. 2 Total=7 ORs=0 XRs=7
   Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
   Sub DIG. 2 GENERAL PURPOSE PROGRAMMABLE DIGITAL COMPUTER SYSTEMS

6. 364/273.2 Total=6 ORs=0 XRs=6
   Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
   Sub ???.13 POWER SYSTEM CONTROL
   Sub 273.2 .On demand

7. 364/273.3 Total=5 ORs=0 XRs=5
   Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
   Sub ???.13 POWER SYSTEM CONTROL
   Sub 273.3 .Partial

8. 395/556 Total=5 ORs=3 XRs=2
   Class 395 INFORMATION PROCESSING SYSTEM ORGANIZATION
   Sub 555 CLOCK, PULSE, OR TIMING SIGNAL GENERATION OR ANALYSIS
   Sub 556 .Generation and selection of multiple clocks, variable clocks, or frequencies

9. 364/948.8 Total=4 ORs=0 XRs=4
   Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
   Sub ???.21 GENERIC OPERATION
   Sub 948.4 .Power control
   Sub 948.8 ..Reduction

10. 364/236.2 Total=3 ORs=0 XRs=3
    Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
    Sub ???.4 INPUT/OUTPUT DEVICES

Sub 236.2 .Disc storage

11. 364/248.1 Total=3 ORs=0 XRs=3
Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
Sub ???.8 STORAGE ELEMENTS
Sub 248.1 .Disk

12. 364/264.6 Total=3 ORs=0 XRs=3
Class 364 ELECTRICAL COMPUTERS AND DATA PROCESSING SYSTEMS
Sub ???.11 PERFORMANCE MONITORING
Sub 264 .Anticipate/monitor
Sub 264.6 ..Status/busy/idle

13. 395/800 Total=3 ORs=3 XRs=0
Class 395 INFORMATION PROCESSING SYSTEM ORGANIZATION
Sub 800 PROCESSING ARCHITECTURE

Patent Report:

Ref Patent Id Issue/File US Class (OR) Title
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1 05218704 Jun 8 1993 395/750 Real-time power conservation for
Oct 30 1989 portable computers
Status: certificate of correction has been issued
Inventor: Watts, Jr.; LaVaughn F. et al.
Assignee: Texas Instruments
Abstract:
A real-time power conservation apparatus and method for portable computers employs a monitor to determine whether a CPU may rest based upon a real-time sampling of the CPU activity level and to activate a hardware selector to carry out the monitor's determination. If the monitor determines the CPU may rest, the hardware selector reduces CPU clock time; if the CPU is to be active, the hardware selector returns the CPU to its previous high speed clock level. Switching back into full operation from its rest state occurs without a user having to request it and without any delay in the operation of the computer while waiting for the computer to return to a "ready" state. Furthermore, the monitor adjusts the performance level of the computer to manage power conservation in response to the real-time sampling of CPU activity. Such adjustments are accomplished within the CPU cycles and do not affect the user's perception of performance and do not affect any system application software executing on the computer.

2 05590061 Dec 31 1996 364/571.03 Method and apparatus for

thermal
May 12 1994 management in a computer
system
Inventor: Hollowell, II; J. Rhoads et al.
Assignee: Apple Computer, Inc.
Abstract:
A method and apparatus for providing thermal management to a computer

system where the internal temperature is measured and, based on the temperature, heat generated in the computer system is reduced by turning off a portion of the system. When the portion of the system is off, no power is consumed by that portion. Accordingly, no heat is generated as well. In this manner, the heat generated in the computer system is reduced.

3 05577220 Nov 19 1996 395/416 Method for saving and
restoring
Oct 3 1995 the state of a CPU executing
code
in protected mode including
estimating the value of the
page
table base register
Inventor: Combs; James L. et al.
Assignee: International Business Machines Corporation
Abstract:
A method of saving and restoring the state of a CPU operating code in

protected mode on a computer system. The save method makes use of BIOS operating in shadow RAM located in a region where linear addresses equal physical addresses while saving the state of the CPU. The registers that cannot be directly saved to memory are determined by searching the system

memory for data structures that correspond to the particular register.
The
restore method uses dummy page tables that point to the shadowed BIOS to allow the CPU to reenter protected mode without generating a protection fault.

4 05497494 Mar 5 1996 395/750 Method for saving and
restoring
Jul 23 1993 the state of a CPU executing
code
in protected mode
Inventor: Combs; James L. et al.
Assignee: International Business Machines Corporation
Abstract:
A method of saving and restoring the state of a CPU operating code in

protected mode on a computer system. The save method makes use of BIOS operating in shadow RAM located in a region where linear addresses equal physical addresses while saving the state of the CPU. The registers that cannot be directly saved to memory are determined by searching the system

memory for data structures that correspond to the particular register. The restore method uses dummy page tables that point to the shadowed BIOS to allow the CPU to reenter protected mode without generating a protection fault.

5 05623647 Apr 22 1997 395/556 Application specific clock
Mar 7 1995 throttling
Inventor: Maitra; Amit K.
Assignee: Intel Corporation
Abstract:
An apparatus for managing the operating speed of a microprocessor is described. The apparatus adjusts the CPU clock of the microprocessor to meet the computing requirement of applications run by the microprocessor.

The apparatus prevents the microprocessor from operating at peak speeds when not required, thus reducing the power consumption and heat dissipation of the microprocessor. A method for managing the operating speed of a microprocessor is also described. The method comprises the steps of determining the application that is run in the present time quantum, determining the application's computing requirement, and adjusting the microprocessor's operation speed to meet the requirement.

6 05625826 Apr 29 1997 395/750 Apparatus for reducing computer
Jun 7 1995 system power consumption
Inventor: Atkinson; Lee W.
Assignee: Compaq Computer Corporation
Abstract:
A battery powered computer system determines when the system is not in use by monitoring various events associated with the operation of the system. The system preferably monitors the number of cache read misses and write operations, i.e., the cache hit rate, and reduces the system clock frequency when the cache hit rate rises above a certain level. When the cache hit rate is above a certain level, then it can be assumed that the processor is executing a tight loop, such as when the processor is waiting for a key to be pressed and then the frequency can be reduced without affecting system performance. Alternatively, the apparatus monitors the occurrence of memory page misses, I/O write cycles or other events to determine the level of activity of the computer system.

7 05511202 Apr 23 1996 395/750 Desktop computer system having
Jul 26 1993 zero-volt system suspend and
control unit for ascertaining
interrupt controller base
address
Inventor: Combs; James L. et al.
Assignee: International Business Machines Corporation
Abstract:
A desktop computer system having the capability to suspend and resume

the state of the computer system. The suspended system state is saved to the system hard file such that system power may be removed, effectively allowing a system suspend requiring no power from the power supply.

8 05404546 Apr 4 1995 395/750 BIOS independent power management
Feb 16 1993 for portable computer
Inventor: Stewart; Gregory N.
Assignee: Dell USA
Abstract:
Method and apparatus for effecting BIOS independent power management of a personal computer system having a processor complex connected via a system bus to at least one I/O device capable of operating in a reduced power consumption state. A power control system comprising a dedicated power management microcontroller monitors the activity of various I/O devices. When a particular device or combination of devices has remained inactive for the preselected time interval, the power control system issues a bus request to a processor complex. When the processor complex acknowledges the bus request, the power control system asserts control as

master of the system bus and performs the operations necessary to cause at
least one device to enter a reduced power consumption state. The power control system then surrenders control of the bus to the processor complex. In one aspect, a CPU clock controller is utilized to reduce the processing speed of the processor complex CPU.

9 05396635 Mar 7 1995 395/800 Power conservation apparatus
Feb 12 1993 having multiple power reduction
levels dependent upon the activity
of the computer system
Inventor: Fung; Henry T. S.
Assignee: Vadem Corporation
Abstract:
A power conservation system in a computer system which includes a processing unit operating under control of an operating system. The computer system generates distinct call functions to the operating system

where each call function is either in an active class or an idle class. The power conservation system has a plurality of states of operation including an ON state, a DOZE state, a SLEEP state and an OFF state. An activity monitor monitors the activity of the computer system and generating control signals for selecting one of the state of operation for
the computer system. The activity monitor includes a storage for storing a
call value for each distinct call function and activity threshold values for the various states of operation. The call values are weighted for the

call functions whereby different call functions have a greater or lesser impact on the value of an activity level. The call value for each call function is retrieved when the call function is made to the operating

system. The retrieved call values are sequentially accumulated to form an activity value which indicates the activity level of the computer system. A comparator compares the activity value with the threshold values and in response to the comparison generates a control signal to a power controller which selects the states of operation for the computer system, thereby regulating the power consumption of the computer system based on the activity of the computer system.

10 05564015 Oct 8 1996 395/184.01 CPU activity monitoring through
Dec 28 1995 cache watching
Inventor: Bunnell; James C.
Assignee: AST Research, Inc.
Abstract:
A central processing unit ("CPU") activity monitor and method provides CPU activity information. The CPU activity monitor includes a timer and an activity event counter for receiving a plurality of mode signals from the CPU, a cache miss signal from a cache memory system, and a clock signal from a clock. An activity-to-inactivity value defines when the CPU transitions from an active state to an inactive state. An activity threshold defines when the CPU transitions from an inactive state to an active state.

11 05548763 Aug 20 1996 395/750 Desk top computer system having
Jul 26 1993 multi-level power management
Inventor: Combs; James L. et al.
Assignee: International Business Machines Corporation
Abstract:
A computer system having four states of power management: a normal operating state, a standby state, a suspend state, and an off state. The standby state is characterized by devices, such as a video controller and a hard drive, being placed into a low-power mode transparent to the operating system and the applications executing on the computer system. The suspend state is characterized by executing code being interrupted and the state of the computer system being saved to a file on the hard drive in such a manner that system power may be removed after the state of the computer system is saved to the hard drive. Later, after system power is restored, the state of the computer system is resumed by reading from the hard drive and loading it in such a manner that the operating system and application programs are not adversely affected. The normal operating state and the off state correspond to the typical on and off states of more conventional computer systems. The suspend/resume/standby feature is

implemented at a low cost using many standard components.

12 05511205 Apr 23 1996 395/750 System for distributed power
Dec 8 1994 management in portable
computers
Inventor: Kannan; Krishnamurthi et al.
Assignee: International Business Machines Corporation
Abstract:
A system and method for managing power in a portable, pen-based notebook computer. The system and method provides for minimizing power consumption by collecting and interpreting power related data of various processing elements while hiding many of the details from the end-user. The system monitors, collects, and acts upon power-related data in a portable computer to maximize the amount of time the portable computer can
be used between battery re-charging with minimal user intervention. The system has a plurality of independently controllable power planes which are selectively powered so that the portable computer consumes the minimum
power necessary to perform a particular function and a plurality of central processing units (CPUs) operating asynchronously with respect to each other. The present invention is further comprised of an on/off glue logic for monitoring battery condition, user invoked functions, and system
state and power management for controlling the operation of each of the CPUs as a function of the conditions sensed.

13 05423045 Jun 6 1995 395/750 System for distributed power
Apr 15 1992 management in portable
computers
Inventor: Kannan; Krishnamurthi et al.
Assignee: International Business Machines Corporation
Abstract:
A provides a system and method for managing power in a portable, pen-based notebook computer. The system and method provides a means for minimizing power consumption by collecting and interpreting power related
data of various processing elements while hiding many of the details from
the end-user. The system monitors, collects, and acts, upon power-related
data in a portable computer to maximize the amount of time the portable computer can be used between battery re-charging with minimal user intervention. The system has a plurality of independently controllable power planes and a plurality of central processing units (CPUs) operating
asynchronously with respect to each other. The present invention is further comprised of an on/off glue logic means for monitoring battery condition, user invoked functions, and system state and a power management
means for controlling the operation of each of the CPUs as a function of the conditions sensed by a sensing means.

14 05513359 Apr 30 1996 395/750 Desktop computer having a

single-
Jul 23 1993 switch suspend/resume function
Inventor: Clark; Michael W. et al.
Assignee: International Business Machines Corporation
Abstract:
A computer system having a suspend/resume capability in addition to the normal operating state and the off state. Closure events of single momentary pushbutton switch control changes between the normal operating state, the suspend state, and the off state, depending on the value of a flag. If the flag is set in a certain state, closure events of the switch

cause the computer system to change back and forth between the normal operating state and the off state. If the flag is set in a different state, closure events of the switch cause the computer system to change back and forth between the normal operating state and the suspend state. The switch also controls the video subsystem of the computer system such that pressing the switch blanks the video display terminal giving the user
instantaneous feedback of the switch press.

15 05481733 Jan 2 1996 395/750 Method for managing the power
Jun 15 1994 distributed to a disk drive in a
laptop computer
Inventor: Douglis; Frederick et al.
Assignee: Panasonic Technologies, Inc.
Abstract:
A method for managing the power consumed by a disk drive in a portable
laptop computer which includes quantizing predetermined periods of disk inactivity into states which are stored in a state table in memory. Based

upon a history of disk accesses by a user, the number of transitions between each pair of states is counted and stored in memory. In view of this history, a future period of disk inactivity can be predicted and said
prediction is compared with a threshold value. If the predicted period of

disk inactivity is greater than the threshold value, the computer is automatically placed in a low power mode by spinning down the disk. If not, the disk continues to spin.

16 05493670 Feb 20 1996 395/750 Adaptive disk spin-down method for
Dec 1 1994 managing the power distributed to
a disk drive in a laptop computer
Status: certificate of correction has been issued
Inventor: Douglis; Frederick et al.
Assignee: Panasonic Technologies, Inc.
Abstract:
A method for managing the power consumed by a disk drive in a portable

laptop computer which includes spinning the disk up during period when the computer apparatus is in an active or idle mode, creating a threshold to determine when to spin down the disk as a function of a period of disk inactivity, spinning the disk down when the threshold is exceeded in order to reduce the power consumption of the disk, automatically increasing the threshold when an undesirable spin up of the disk has occurred and automatically decreasing the threshold when an acceptable spin up of the disk occurs. By virtue of this method, the threshold for disk inactivity is continually monitored and adjusted to maintain a balance between energy consumption and undesirable disk spin down.

17 05388061 Feb 7 1995 364/708.1 Portable computer for one-handed
Sep 8 1993 operation
Inventor: Hankes; Elmer J.
Abstract:
A portable computer with at least one reduced-key keypad for one-handed operation is disclosed. The preferred embodiment of the portable computer includes two data display screens for displaying data from two programs running simultaneously. It also includes two keypads, both of which are capable of entering the full range of alphanumeric characters and software control commands.

18 05664201 Sep 2 1997 395/750.03 Drive control system for
Apr 12 1993 microprocessor according to operational state and ambient temperature condition thereof
Inventor: Ikedea; Osamu
Assignee: Dia Semicon Systems Incorporated
Abstract:
A drive control system for a microprocessor comprises a switching circuit 5 for varying a drive condition of the microprocessor by varying a processing speed and a power consumption in mutually related manner, an operational state dependent control portion including a status judgment circuit 7, an address monitoring circuit 8, and an address detecting circuit 9, for monitoring the operational state of the microprocessor and controlling the switching circuit 5 for adapting the processing speed to the operational state, and a temperature dependent control portion comprising a temperature sensor 10 and a comparator 11, for lowering the power consumption of the microprocessor when the temperature condition of the microprocessor higher than a predetermined criterion temperature is detected.

19 05230074 Jul 20 1993 395/750 Battery operated computer power
Jan 25 1991 management system
Inventor: Canova, Jr.; Francis J. et al.

Assignee: International Business Machines Corporation
Abstract:
A computer has two processors. A main processor operates under the control of an operating system and provides overall control of the computer for executing application programs. The main processor also assists in power management by executing certain interrupts and controlling a power control register to turn power on and off to various devices. A power management processor monitors ambient temperature and humidity, and battery conditions, and generates interrupts as a result of

predetermined changes. Such processor also controls charging of the battery. Logic means are responsive to predetermined conditions to also generate interrupts.

20 05581482 Dec 3 1996 364/551.01 Performance monitor for digital
Apr 26 1994 computer system
Status: certificate of correction has been issued
Inventor: Wiedenman; Gregory B. et al.
Assignee: Unisys Corporation
Abstract:
An apparatus for monitoring the performance of a computer system. A number of performance monitoring hardware elements may be placed throughout a computer system to simultaneously monitor the performance of

a number of distinct components within the computer system. An advantage of the present invention over a software based approach is that the present invention allows any node within the computer system to be monitored. In addition, the present invention does not run on the systems

CPU and therefore the performance monitoring function does not decrease system performance while operating. Finally, because the present invention
does not run on the system's CPU, the results of the performance monitoring function may be more accurate than a software base approach.